METHOD AND APPARATUS FOR HIGH RATE PACKET DATA TRANSMISSION

CLAIM OF PRIORITY UNDER 35 U.S.C. §120

The present application for patent is a Continuation and claims priority to co-pending patent application Ser. No. 11/540,286, entitled "METHOD AND APPARATUS FOR HIGH RATE PACKET DATA TRANSMISSION," filed Sep. 29, 2006, which is a continuation of U.S. Pat. No. 7,184,426, entitled "METHOD AND APPARATUS FOR BURST PILOT FOR A TIME DIVISION MULTIPLEX SYSTEM," issued Feb. 27, 2007, which is a continuation of U.S. Pat. No. 7,079,550, entitled "METHOD AND APPARATUS FOR HIGH RATE PACKET DATA TRANSMISSION," issued on Jul. 18, 2006, which is a continuation of U.S. Pat. No. 6,574,211, entitled "METHOD AND APPARATUS FOR HIGH RATE PACKET DATA TRANSMISSION," issued on Jun. 3, 2003, all assigned to the assignee hereof and hereby expressly incorporated by reference herein.

BACKGROUND OF THE INVENTION

I. Field of the Invention

The present invention relates to data communication. More particularly, the present invention relates to a novel and improved method and apparatus for high rate packet data transmission.

II. Description of the Related Art

A modern day communication system is required to support a variety of applications. One such communication system is a code division multiple access (CDMA) system which conforms to the "TIA/EIA/IS-95 Mobile Station-Base Station Compatibility Standard for Dual-Mode Wideband Spread Spectrum Cellular System," hereinafter referred to as the IS-95 standard. The CDMA system allows for voice and data communications between users over a terrestrial link. The use of CDMA techniques in a multiple access communication system is disclosed in U.S. Pat. No. 4,901,307, entitled "SPREAD SPECTRUM MULTIPLE ACCESS COMMUNICATION SYSTEM USING SATELLITE OR TERRESTRIAL REPEATERS," and U.S. Pat. No. 5,103,459, entitled "SYSTEM AND METHOD FOR GENERATING WAVEFORMS IN A CDMA CELLULAR TELEPHONE SYSTEM," both assigned to the assignee of the present invention and incorporated by reference herein.

In this specification, base station refers to the hardware with which the mobile stations communicate. Cell refers to the hardware or the geographic coverage area, depending on the context in which the term is used. A sector is a partition of a cell. Because a sector of a CDMA system has the attributes of a cell, the teachings described in terms of cells are readily extended to sectors.

In the CDMA system, communications between users are conducted through one or more base stations. A first user on one mobile station communicates to a second user on a second mobile station by transmitting data on the reverse link to a base station. The base station receives the data and can route the data to another base station. The data is transmitted on the forward link of the same base station, or a second base station, to the second mobile station. The forward link refers to transmission from the base station to a mobile station and the reverse link refers to transmission from the mobile station to a base station. In IS-95 systems, the forward link and the reverse link are allocated separate frequencies.

The mobile station communicates with at least one base station during a communication. CDMA mobile stations are capable of communicating with multiple base stations simultaneously during soft handoff. Soft handoff is the process of establishing a link with a new base station before breaking the link with the previous base station. Soft handoff minimizes the probability of dropped calls. The method and system for providing a communication with a mobile station through more than one base station during the soft handoff process are disclosed in U.S. Pat. No. 5,267,261, entitled "MOBILE STATION ASSISTED SOFT HANDOFF IN A CDMA CELLULAR COMMUNICATIONS SYSTEM," assigned to the assignee of the present invention and incorporated by reference herein. Softer handoff is the process whereby the communication occurs over multiple sectors which are serviced by the same base station. The process of softer handoff is described in detail in U.S. patent application Ser. No. 08/763,498, entitled "METHOD AND APPARATUS FOR PERFORMING HANDOFF BETWEEN SECTORS OF A COMMON BASE STATION," filed Dec. 11, 1996, now U.S. Pat. No. 5,933,787, issued Aug. 3, 1999, by Klein S. Gilhousen et al., assigned to the assignee of the present invention and incorporated by reference herein.

Given the growing demand for wireless data applications, the need for very efficient wireless data communication systems has become increasingly significant. The IS-95 standard is capable of transmitting traffic data and voice data over the forward and reverse links. A method for transmitting traffic data in code channel frames of fixed size is described in detail in U.S. Pat. No. 5,504,773, entitled "METHOD AND APPARATUS FOR THE FORMATTING OF DATA FOR TRANSMISSION," assigned to the assignee of the present invention and incorporated by reference herein. In accordance with the IS-95 standard, the traffic data or voice data is partitioned into code channel frames which are 20 msec. wide with data rates as high as 14.4 Kbps.

A significant difference between voice services and data services is the fact that the former imposes stringent and fixed delay requirements. Typically, the overall one-way delay of speech frames must be less than 100 msec. In contrast, the data delay can become a variable parameter used to optimize the efficiency of the data communication system. Specifically, more efficient error correcting coding techniques which require significantly larger delays than those that can be tolerated by voice services can be utilized. An exemplary efficient coding scheme for data is disclosed in U.S. patent application Ser. No. 08/743,688, entitled "SOFT DECISION OUTPUT DECODER FOR DECODING CONVOLUTIONALLY ENCODED CODEWORDS," filed Nov. 6, 1996, now U.S. Pat. No. 5,933,462, issued Aug. 3, 1999, by Andrew J. Viterbi et al., assigned to the assignee of the present invention and incorporated by reference herein.

Another significant difference between voice services and data services is that the former requires a fixed and common grade of service (GOS) for all users. Typically, for digital systems providing voice services, this translates into a fixed and equal transmission rate for all users and a maximum tolerable value for the error rates of the speech frames. In contrast, for data services, the GOS can be different from user to user and can be a parameter optimized to increase the overall efficiency of the data communication system. The GOS of a data communication system is typically defined as the total delay incurred in the transfer of a predetermined amount of data, hereinafter referred to as a data packet.

Yet another significant difference between voice services and data services is that the former requires a reliable communication link which, in the exemplary CDMA communication system, is provided by soft handoff. Soft handoff results in redundant transmissions from two or more base